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## Science and Art Gossip.

It will have been observed that our "Answers to Correspondents" have ceased. It was the only way out of a growing and intolerable difficulty. Readers would *not* recognise that the answers *were* answers, not remarks addressed to all our readers. Each reply brought an average of a dozen comments, a dozen rejoinders, a dozen remonstrances. Besides, those numerous readers who wrote usefully suggestive letters, or asked reasonable questions, found themselves (of necessity) associated with a much greater number of others who asked ridiculous questions and suggested monstrous theories—the railing Rab-shakehs and paradoxists who infest every association for seeking knowledge, and render nugatory the efforts of those who want only to get at the truth. The attempt to get rid of that class of querists, that more room may be found for the sensible ones, who, though numerous, are overwhelmingly outnumbered, only results in presenting an editor in a false aspect. Those who have not seen the rude or foolish letters we have received cannot conceive the fitness of the blunt or jesting replies which those letters have educed.

In future, then, we propose to answer only such letters—if any at all—as are fit for insertion, either in full or in abstract. As our space cannot be enlarged, a much larger proportion of letters received must, unless of considerable value or very succinct, be passed over.

The *Academy*, commenting pleasantly enough otherwise on the new volumes for the Knowledge Library series, notes that no date is given on the title-page, and that Mr. Proctor's name alone appears on the cover. The comment is just, but "Mr. Proctor" has nothing to do with the matter. The use of his name alone on the cover results from a little carelessness on the part of the binder, insignificant enough in itself, and only unpleasant in its consequences if it should lead any mistakenly to imagine that Mr. Proctor had sanctioned the arrangement, instead of learning first about it only when the book had already been issued to the reviewers. The only suggestion made by him on the subject of the cover was that it should bear five or six gilt leaves, each showing the name of a contributor, his own at the foot. This was regarded as unpractical, but he had no idea his name alone would appear on the cover. The title-page shows what Mr. Proctor's wishes were in that respect—where his name follows that of his esteemed fellow-writers. Why the date was omitted on the title-page he is unable to say; the year and month in which the last proofs were received is duly appended to the preface in both volumes.

In an interesting article on the Great Comet—now scarce visible, by the way—Prof. Young expresses his belief that even were a comet, whose mass equalled the earth's, to run straight into the sun, the effect would only be to add to the sun's store of heat, not to increase the emission of heat. Mr. Mattieu Williams expressed the same opinion three or four months ago in the *Gentleman's Magazine*. It is probably correct. The heat generated by the downfall of such a comet on the sun's surface would be employed in producing changes of physical condition, and given out afterwards as the matter so changed resumed its original state.

Prof. Young also throws out, as more probable than a theory thrown out by ourselves, the suggestion that the dark region behind the nucleus of a comet is a region occupied by matter opaque to the light coming from the surrounding envelope of the tail, and, therefore, cutting off half the light which would otherwise reach us. This is a simpler and more probable theory than our own; and if the light from the darker part of the tail is really equal to half the light from the neighbouring brighter parts, will have, we think, to be accepted as in all probability correct.

It has been arranged that a series of six lectures on astronomy shall be given in St. James's Hall, beginning on Wednesday, March 21 next. The other dates will be March 28, April 4, 7, 11, and 14.

The Dublin *Freeman's Journal* advocates the construction of a ship canal between Dublin and Galway. "A full day would thus be saved between America and Liverpool, which would represent an enormous money gain, without estimating the saving of life and property from wreck; a million acres of bog at least would be reclaimed, and the surplus labour of Ireland would be profitably employed for years. The work would probably cost fifty millions; the reclaimed land would be worth nearly the money. Its effect on Ireland would be incalculably to its advantage."

The *Times* Geneva correspondent says an engineer who has just visited the scene of the disaster near Fort de l'Ecluse describes the condition of things as very serious. The entire side of Mont Credo, on which the forts are built, appears to be giving way, and further and more dangerous earthslips are feared. The lower fort is considered past saving, and the garrison has been withdrawn. The rocks on which the forts stand, and which look solid enough to support them for ages, are said to be undermined. If they should fall into the Rhone, which, compressed between two lofty cliffs, is exceedingly narrow thereabouts, the course of the river will be completely blocked, and the entire valley, for a length of more than twenty miles, joined to the lake. This is another evidence, on the large scale, of the great levelling action which is going on continually all over the world, the ever-active tendency on the part of mountain masses to get to a lower level, having plenty to work upon in Switzerland.

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A "Moving Bog."—A correspondent of the *Dublin Express* writes as follows:—The incessant downpours of rain have, as already stated, produced immense floods in this neighbourhood. A bog, too, was reported to have moved a considerable distance, causing serious losses to the adjoining farms. Having heard many reports about this "moving bog," I resolved to visit the scene of devastation. Never have I witnessed as strange a phenomenon. About mid-way between Castlerea and Bellinagare—a distance of six miles—there is a gently sloping vale abounding in rich meadow and pasture lands. The road at this point is somewhat higher than the adjacent fields. Along this valley the bog has forced its way. On reaching the road it was held in check for a considerable time, but eventually it burst across, and rushed with amazing rapidity, covering in its course upwards of 120 acres of fine "pasture" lands. One farm-house stands quite surrounded with the mud, the occupants having to flee for their lives, leaving a cart on which they were busily heaping some of their furniture behind. All communication between Castlerea and Bellinagare (by this route) is cut off, huge masses of bog coatee, with heather, remaining on the road for nearly a quarter of a mile fully ten feet deep. Being anxious to view the source from which it issued, I started up the field towards the bog; I found it commenced about half a mile from the road, having formed a large subsidence of amazing extent, from which a stream of mud was still irresistibly forcing its way. The gigantic masses of bog borne along in apparently sportive mimicry baffle description. I entered a cabin on the outskirts of a bog, which I was surprised to find clean and comfortable, despite its gloomy surroundings. The old man told me that this bog has been showing signs of moving for many years back. He attributes the cause to defective drainage, the water having scarcely any outlet. He stated that it started very suddenly, reaching the road, nearly half a mile distant, in less than ten minutes. He sorrowfully pointed out to me his fine little fields, on which he appears to have bestowed much care, the most of them now covered with fully 26 ft. of bog. It has now forced its way into the river Suck, which flows through this town, and immense quantities are passing towards Ballinasloe. Some care and supervision will be required at the various bridges along the Suck to prevent their being filled up. Rain still continues to fall very heavily, and more serious results are apprehended.

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The Wolverhampton Chamber of Commerce has written to the Board of Trade, saying that, though the standard wire gauge proposed by the department was not in every respect such as they would have liked, yet they felt it would fulfil the purposes of a national standard wire gauge. They were so anxious to see a workable gauge introduced, that they preferred not to make any suggestions, lest they should hinder, or possibly frustrate, its adoption.

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The St. Gothard Railway is diverting the bulk of the Italian trade into the hands of Germany, Belgium, and Holland with surprising rapidity. Early fruit and vegetables are conveyed without transhipment from all parts of Italy to Ostend, Antwerp, and Rotterdam, whence they are taken by fast steamers to London and other English ports. The Great Eastern Railway Company alone is stated to have carried over 6,000 tons of these goods, *vid* Antwerp and Harwich, in a few months. Malta is now brought nearer, and Algerian produce, such as green peas and early potatoes, is made more available. On the other hand, Italy is receiving an unprecedented, not to say overwhelming, amount of attention from Germany. In two months after the opening of the St. Gothard route the Germans despatched 40,000 tons of coal, 107 tons of unmanufactured iron and hardware, 14,000 tons of machinery, 693 tons of copper, 17,409 tuns of spirits 1,446 tons of paper, and 76 railway waggons, the export, the *Times* says, of all these articles having previously been either *nil* or quite nominal.

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The Town Council of Southampton have accepted a tender for continuing the boring in the chalk which was abandoned in 1851, after it had reached a depth of 439 yards bored in the chalk or chalk marl, but its continuation will now probably carry it into the lower green-sand in a short time. The boring commences at the bottom of a well 563 ft. in depth. Chalk mud now fills about 36 yards of the bottom of the boring. The temperature, at a depth of 1,210 ft., has been recently found to be nearly 72°, that of the outer air being at the time 49°; the increase in temperature being thus 1° deg. Fah. for every 52·6 ft. in depth.

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Pneumatic Tubes at Philadelphia.—The United States Post Office Department is considering the feasibility of laying down very large pneumatic tubes for the Philadelphia Post Office, connecting it with the mail depôts in the city. The object is to avoid the present slow transference of mails from trains by coaches to the central office. The idea is with the English Post-office an old and unpractical one.

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Gold in Victoria.—A comparative statement of the yield of gold in Victoria for the two first quarters of this year has been compiled by the Mining Department from the mining surveyor's reports. It shows that in the first quarter the yield was 189,826 oz. 8 dwt. 4 gr., and for the second quarter 213,394 oz. 17 dwt. 5 gr., showing an increase of 23,568 oz. 9 dwt. 1 gr. Recent reports of surveyors at Sandhurst and Ballarat are favourable, the former stating that in his district there was an improvement of quite 40 per cent. in the yields of the claims for the second quarter of 1882.

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The *Engineer* says a meeting of street railway officials was held in Boston, U.S., Dec. 12, for the purpose of forming a National Street Railway Association. The temporary chairman, Mr. Moody Merrill, in outlining the scope of the proposed organisation, said that there are now organised and doing business in that country and Canada 415 street railway companies. These companies employ about 35,000 men, and run 18,000 cars. More than 100,000 horses are in daily use, to feed which it requires annually 150,000 tons of hay and 11,000,000 bushels of grain. These companies own and operate over 3,000 miles of track. The whole number of passengers carried annually is over 1,212,400,000. The amount of capital invested in these railways exceeds 150,000,000 dols. Messrs. C. B. Clegg, of Ohio, and C. C. Woodruff, of New York, were chosen secretaries.

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Spirit of turpentine is now [made, says a contemporary, from sawdust and refuse of the sawmill. It is extracted by a sweating process, and yields 14 gallons of spirits, three to four gallons of resin, and a quantity of tar per cord.

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Herren Ganz & Co. are about to illuminate the National Theatre, Buda-Pesth, by means of a thousand Swan lamps, 200 of which they are also fitting up in a steam corn-mill.

# A NATURALIST'S YEAR.

By Grant Allen.

## VI.—THE PEEWIT CRIES.

OUT on the broad downs, where the grass is now growing taller and lusher, and the sleepy beetles are beginning to crawl lazily across the narrow footpath, a sudden cry in the air makes one look up skyward for a second, to see a pair of peewits tumbling and twirling together gracefully overhead, in their accustomed aërial antics. It is early, indeed, for our dappled friends to be out already at their annual love-making. To be sure, we all know that "in the spring the wanton lapwing gets himself another crest;" but it is hardly spring, in any fair sense of the word, as yet, and the wanton lapwing is surely taking time by the forelock to-day, with too trustful a confidence in the good intentions of our treacherous English climate; for the tumbling and the crest-growing are all of them mere minor preliminaries to the serious work of mating, and the season is still too raw and doubtful for even the bold and saucy lapwing to confide to it the care of his callow young. All these queer antics of birds in the springtime—the playing of capercailzie, the dancing of blackcock, the strutting of turkeys, the tumbling of peewits—are but various modes of attracting the attention of prospective mates; and they are almost always, if not invariably, accompanied by the presence of ornamental adjuncts, the result of special selective preferences, exerted throughout countless generations, on the part of the hen birds. One sees the contrast well exhibited in the cases of the blackcock and the red grouse. The former birds hold their annual "courts of love" with great solemnity, where they display themselves in all their beauty before the eyes of their intended mates; and only those birds which have the finest plumes succeed in attracting to themselves a number of hens. Hence the cocks have gradually acquired a handsome and glossy plumage, quite different from that of their sober and unobtrusive grey little partners. The red grouse, on the other hand, hold no "courts of love," and in their case both sexes are similarly attired in a protective suit of russet brown, which closely harmonises with the tints of the dry heather under whose shelter they skulk and hide.

Peewits belong by family to the plover group, and are the most ornamental British species of their race. It is the rule with the wading birds, among which (though one would hardly think it) the plovers are ranked, to show little or no bright colouring; and the terrestrial species of waders, like the peewits—in northern climates at least—are almost always very plain, and often dingy birds. Whenever they possess any ornamental appendages at all, as happens with some of the larger and more dominant kinds, such as the cranes and herons, they take the form of mere crests or top-knots, rather than of brilliant tails, like the peacocks, iridescent necklets, like the humming birds, or brightly-coloured bills, like the fruit-eating toucans. The fact is, the waders are naturally graceful birds; their slender legs, and tall, arching necks, acquired, of course, by survival of the fittest, without regard to beauty as such, have accidentally coincided with the requirements of the highest taste; and the waders seem actually to recognise this graceful character of their generic type, and to do their best through sexual selection to bring it out into stronger relief by carefully-arranged additions. Hence the beautiful peculiarities which the females have fostered and improved, run invariably in the direction of decorative tufts or lappets, so disposed as to mark and intensify the natural gracefulness of form so conspicuous throughout the entire race. For example, in the heron we get a brush of feathers near the nape of the neck and a pendant tassel on the front of the breast; in the ruff we have a perfect collar of erectile plumes around the throat; in the crested crane we find a diadem of hackles set proudly on the crown of its head; and in our own lapwing we see the same tendency in the long crest which points so gracefully backward and upward in continuation of the natural curve of the forehead. Its contour forms, in fact, a perfect line of beauty which Hogarth would certainly have included among the illustrations of his law if he had ever seen a peewit standing erect beside a stream and paying its court in lordly fashion to its admiring lady love. The crest can be raised or depressed alternately at the will of the bird, and it is always displayed to the fullest advantage during the probationary period of the mating season.

The very name of lapwing, by which the peewit is known to most bookish naturalists, itself refers to a point dependent on, or connected with, the curious aërial love-dances that so remarkably distinguish this pretty species of plover. The wings are extremely long and rounded at the tip, so that they lap over and almost conceal the short stumpy tail. These large and spreading pinions have almost undoubtedly been acquired in the course of performing the annual love-dances; for Mr. Darwin has shown that the wing feathers have often been modified for similar purposes in various birds, and sometimes even have assumed a peculiar shape in order to produce a humming noise, which proves as attractive as musical song to the ladies of their kind. There are some distinguished biologists, it is true, who still doubt the efficiency of such selective preferences on the part of female birds in modifying the specific type; but how anybody who has once watched the courtship of the peewits in early spring can have any hesitation on the subject surpasses my limited comprehension. First, you may see the cock and hen strutting about together on the ground, he elevating and depressing his crest as he struts, and she demurely observing him from a little distance with the critical eye of a connoisseur in ploverine deportment. Then, after a few turns on the earth, the cock bird lifts his broad wings stoutly, and begins to rise with his peculiar flitting motion into the blue sky above. There he flaps and tumbles in a most demonstrative fashion, sometimes sailing off to windward or leeward, as if to exhibit his address, and sometimes seeming to fall precipitously towards the ground, but always keeping true to the fixed centre where his charmed mate is coyly watching his evolutions with pretended nonchalance. By-and-by he will glide down suddenly to her side with a mute appeal for applause, and then the two will rise together once more, and wheel and circle in concert till even their powerful wings begin to tire. As they cleave the air merrily, their joy finds voice from time to time in the ringing cry of peewit, peewit; and looking up from below, you see just the gleam of two sailing black and white bodies in the sunshine, and rejoice with them in your heart that spring has come again. After the courtship, however, begin the more serious cares of matrimony and motherhood, ringed round with many dangers and difficulties for the poor feckless lapwing. Ages ago, when farmers were not, it learnt to make its nest, or rather to lay its eggs, upon the bare ground, without even a few bits of straw or feather to keep them warm; and it still persists in this ancestral habit among the furrows and ploughed fields of agricultural England. Still, the very absence of a nest makes the eggs all the harder to find, for they look like little round stones lying loose on the soil, and the mother-bird has acquired the cunning trick of running to a little distance away before she rises, with her body tucked close to the

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ground, so as to conceal the place where the precious objects are laid. In spite of all her precautions, however, great quantities are found and eaten; for the so-called plovers' eggs of London game-dealers belong by just right to the lapwing alone. After the young are hatched, the peewits become more nocturnal in their habits, and also congregate in large flocks, instead of being seen in pairs, as during the earlier part of the year. This is a common trick with the plover tribe, and it doubtless serves a good purpose in the economy of the species. While nesting goes on, in the flush season, concealment and solitary habits are most important; in autumn and winter, the dearth of food compels all alike to flock together towards the best and richest low-lying feeding places.

## PLEASANT HOURS WITH THE MICROSCOPE.

By Henry J. Slack, F.G.S., F.R.M.S.

FEW English microscopists seem acquainted with Max Schulze's artificial diatoms, and still fewer have made them. The process is very easy, and not only supplies beautiful and curious objects, but also illustrates some properties of silica which are of importance in the organic world. Take a wide-mouthed bottle that holds six or eight ounces. Mix together a teaspoonful of powdered fluor spar, and rather less of powdered glass or sharp, clean sand. Put the mixture into a bottle, and pour upon it enough sulphuric acid to give it a thorough wetting. Have ready a tuft of cotton wool, as loose as the fibres can be kept, after dipping them in water. Place this moist tuft in the mouth of the bottle, spreading it out so that it cannot tumble in; then put a paper cap over it to check evaporation, and leave it for some hours, or till the next day. The acid decomposes the fluor spar and causes it to evolve fluoric acid, which seizes some of the silica of the glass and carries it off up to the wet cotton. Here, again, a chemical action takes place, and part of the silica is deposited like hoar-frost upon the cotton. This deposit should be scraped off as gently as possible with a little piece of stick—say a lucifer-match, split with a penknife to give it a blunt edge. Let it fall into a watch-glass, or any small vessel of glass or china, and pour water very softly upon it, letting it run off quickly. This washes a corrosive acid out, and leaves pure hydrate of silica behind in a variety of curious shapes. Some will be nearly globular, others like Amalthæa's horn, others crooked tubes, &c. The largest should be examined as opaque objects, and will be found like strange glass vessels beautifully beaded. The finer ones should be gently crushed and mounted as transparent objects dry, and also in Canada balsam. They will most likely exhibit a considerable number, perhaps a dozen or more, of diatom patterns. Some will be finely and uniformly beaded, like *Pleurosigma angulatum*. Others, coarsely beaded, more like *Triceratium*. Some are likely to be so fine and delicate that their beading requires a magnification of 1,000 diameters or more to show it well. Besides plain-beaded patterns, the writer has usually obtained compound patterns, such as large beads surrounded by little ones.

If a judicious selection is made, the fragments of the little vesicles would be assuredly taken for portions of well-known diatoms.

It occurred to the writer that it would be interesting to obtain the silica deposit in another way. Instead of allowing the silicic-fluoride gas to come into contact with wet cotton, some of it was passed through a mixture of four parts of glycerine and one of water. This is readily managed by using a very small flask or a tube bottle to contain the fluor spar, glass, and acid, and fitting to its mouth a few inches of bent glass tube. A gentle heat from a spirit-lamp causes the gas to be given off freely, and by dipping the tube just under the glycerine and water, which may be held in an egg-cup, silica films are instantly formed. The experimenter must be on the watch lest the tube gets stopped up with the silica deposit. As soon as it shows any signs of this, clear it out with a fine wire. Only a very small quantity is required of the various chemicals—a quarter or less of the quantities in the first experiment. The films should be washed, as the vesicles were, and then gently crushed and mounted, to be viewed with a quarter and an eighth objectives and dark ground illumination. This is easily managed if the objectives are either old ones of small angular aperture or supplied with a movable stop to reduce their larger apertures when required. The dark ground illumination can be obtained with a large circular stop of an achromatic condensor, or with Mr. Wenham's ingenious illuminator, which gives beautiful results in the hands of expert manipulators.

Some of these film slides in the writer's collection look like portions of the Milky Way as seen through a telescope, or like resolvable nebulæ. To get these effects, the minute beads in which the silica is deposited must not be piled one above another, but distributed in single layers. A little moving about with a needle-point is sure to get some in this condition.

Many plants and animals require silica in some part of their structure, and water readily dissolves a minute quantity as it acts upon soils containing it. Some sponges require it to make the spicules of various shapes, by which they are strengthened, or made inconvenient for their assailants to bite. Other creatures deposit it in their tissues like miniature cart-wheels (*chirodota*), and others like anchors (*synapta*). The diatoms want it to support and decorate their fine, soft tissues; the canes and grain plants to strengthen their cuticle; and the Pottery-tree of Para to make its stony bark, which the natives use in their fictile manufactures. All can be accommodated, because silica is not only to a certain extent soluble in water, but can exist in the colloid as well as in the crystalline state. All colloid or glue-like bodies differ from crystalloids in an important physical property. The crystalloids in solution will pass freely through parchment paper, or certain membranes, while the colloids remain behind. A solution of water-glass—a silicate of potash, or soda—may be decomposed, and a pure silica solution obtained, by carefully adding hydrochloric acid to it in a parchment paper dialysing drum, and floating the drum in plain water. The hydrochlorate of potash, or soda, gets through the paper, and the silica stays behind.* A strong solution of water-glass, limpid, like water, may be instantly turned into thick jelly by adding a strong acid.

Silica in the crystalline state forms the beautiful quartz minerals, and if, when deposited from water, it had the strong disposition to crystallise which many other substances have, it would not accommodate itself to the various forms the animals and plants require. It might be worth while to try various other substances besides glycerine to mingle with water in film-making experiments. Some interesting results would probably be obtained. It may be well to add that the dealers in chemical apparatus

* If more than two or three per cent. of silica remains in the drum, it is likely to gelatinise.

and materials sell fluor spar in powder, and broken glass is an article most families are acquainted with. In the absence of a pestle and mortar, it may be wrapped in a few folds of brown paper and struck with a hammer to reduce it to powder.

## THE BIRTH AND GROWTH OF MYTH.

III.

By Edward Clodd.

THE names given to the sun in mythology are as manifold as his aspects and influences, and as the moods of the untutored minds that endowed him with the complex and contrary qualities which make up the nature of man. *Him*, we say, not *it*, thus preserving in our common speech a relic, not only of the universal personification of things, but of their division into sex.

The origin of gender is most obscure, but its investment of both animate and inanimate things with sexual qualities shows it to be a product of the mythopœic stage of man's progress, and demands some reference in these papers. The languages of savages are in a constant state of flux, even the most abiding terms, as numerals and personal pronouns, being replaced by others in a few years. And the changes undergone by civilised speech have so rubbed away and obscured its primitive forms that, look where he may, the poverty of the old materials embarrasses the inquirer. If the similar endings to such undoubtedly early words as father, mother, brother, sister, in our own and other related languages, notably Sanskrit, afford any clue, it goes rather to show that gender was a later feature than one might think. But there is no uniformity in the matter. It seems pretty clear that in the early forms of our Indo-European speech there were two genders only, masculine and feminine. The assignment of certain things conceived of as sexless to neither gender, *neutrius generis*, is of later origin. Some of the languages derived from Latin, and, to name one of a different family, the Hebrew, have no neuter gender, whilst others, as the ancient Turkish and Finnish, have no grammatical gender. In our own, under the organic changes incident to its absorption of Norman and other foreign elements, gender has practically disappeared (although ships and nations are still spoken of as feminine), the pronouns *he*, *she*, *it*, being its representative. Such a gain is apparent when we take up the study of the ancestral Anglo-Saxon, with its masculine, feminine, and neuter nouns, or of our allied German with its perplexities of sex, as, *e.g*, its masculine spoon, its feminine fork, and its neuter knife. Turning for a moment to such slight aid as barbaric speech gives, we find in the languages of the hill tribes of South India a curious distinction made; rational beings, as gods and men, being grouped in a "high-caste or major gender," and living animals and lifeless things in a "casteless or minor gender." The languages of some North American and South African tribes make a distinction into animate and inanimate gender; but, as non-living things, the sun, the thunder, the lightning, are regarded as persons, they are classed in the animate gender.

Further research into the radicals of so relatively fixed a language as Chinese, and into more mobile languages related to it, may, perhaps, enlighten the present ignorance; but one thing is certain, that language was "once the scene of an immense personification," and has thereby added vitality to myth. Analogies and conceptions apparent to barbaric man, and in no way occurring to us, caused him to attribute sexual qualities not only to dead as to living things, but to their several parts, as well as, in the course of time, to intellectual and abstract terms. Speaking broadly, things in which were manifest size and qualities, as strength, independence, governing or controlling power, usually attaching to the male, were classed as masculine; whilst those in which the gentler and more subordinate features were apparent were classed as feminine. Of course, marked exceptions to this will at once occur to us, as, *e.g.*, in certain savage and civilised languages, where the sun is feminine and the moon is masculine, but in the main the division holds good. The big is male, and the small is female. The Dyaks of Borneo call a heavy downpour of rain a *he* rain; and, if so strength-imparting a thing as bread is to be classed as either masculine or feminine, we must agree with the negro who, in answer to his master's question, "Sambo, where 's the bread?" replied, "De bread, massa? him lib in de pantry." The mediæval Persians are said to have distinguished between male and female even in such things as food and cloth, air and water, and prescribed their proper use accordingly; while, as Dr. Tylor, from whom the above is quoted, adds, "even we, with our blunted mythologic sense, cannot give an individual name to a lifeless object, such as a boat or a weapon, without in the very act imagining for it something of a personal nature."

But we must not stay longer in these attractive byways of philology, however warranted the digression may be, and must return to the many-titled sun.

Whilst in the more elaborate mythologies of classic peoples we find him addressed in exalted terms which are still the metaphors of poetry, we are nearer the rough material out of which all myth is shaped when among races who speak of sun, moon, and stars as father, mother, and children, and who mean exactly what they say. We may find similar relationships in the solar and lunar deities of Egyptian and classic myth, but profound moral elements have entered into these and dissolved the material. We are face to face with the awful and abiding questions personified in Osiris and Isis, in Œdipus and Jocaste, where for us the sunlight pales and the storm clouds are dispersed before the dazzling mysteries of human life and destiny.

No such matters confront us when in Indian myth we read that the moon is the sun's sister, an aged, pale-faced woman, who in kindness led to her brother two of the tribe who had sprung through a chasm in the sky to the pleasant moonlit land. Neither do they in Australian myth, which shows that the dwellers on Olympus had no monopoly of conjugal faithlessness. For in it the moon's motions are explained as the chase of a jealous husband, one of the bright stars, who found the inconstant in the act of eloping with the moon. Among the bushmen, the moon has incurred the sun's anger and is hacked smaller and smaller by him, till, begging for mercy, a respite is given. But as soon as he grows larger the sun hacks him again. In Slavonic myth the sun cleaves him through, for loving the morning star. The Indians of the far west say that, when the moon is full, evil spirits begin nibbling at it, and eat a portion every night till it is all gone; then a great spirit makes a new moon, and, weary with his toil, falls asleep, when the bad spirits renew their attack. Another not uncommon group of myths is that which speaks of sun and moon as borne across the heavens on the backs of ancestors, as in Greek myth Atlas supports the world.

But a still larger and more widespread body of myth has its source in the patches on the moon's face. In the

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Samoan Islands there are said to be a woman, a child, and a mallet. A woman was once hammering out paper-cloth, and seeing the moon rise, looking like a great bread-fruit tree, she asked it to come down and let her child eat a piece of it. But the moon was very angry at the idea of being eaten, and gobbled up woman, child, and mallet, and there they are to this day. The Selish Indians of North-Western America say that the little wolf was in love with the toad, and pursued her one moonlight night, till, as a last chance, she made a desperate spring on to the face of the moon, and there she is still. In Greenland myth, the moon was in love with his sister and stole in the dark to caress her. She, wishing to find out who her lover was, blackened her hands so that the marks might be left on him, which accounts for the spots. The Khasias of the Himalaya say that the moon falls in love every month with his mother-in-law, who, like a well-conducted matron, throws ashes in his face.

Comparing these with our familiar myths, we have our own Man in the Moon, who is said to be the culprit found by Moses gathering sticks on the Sabbath, although his place of banishment is a popular addition to the Scripture narrative. According to the German legend he was a scoffer who did the same heinous offence on a Sunday, and was given the alternative of being scorched in the sun or frozen in the moon. The Frisians say that he stole cabbages, the load of which he bears on his back. In Icelandic myth the two children familiar to us as Jack and Jill were kidnapped by the moon, and there they stand to this day with bucket on pole across their shoulders, falling away one after the other as the moon wanes,—a phase described in the couplet:

> Jack fell down and broke his crown,
> And Jill came tumbling after.

Mr. Baring Gould, whose essay on this subject in his "Curious Myths of the Middle Ages" gives a convenient summary of current legends, contends that Jack and Jill are the Hjuki and Bil of the Edda, and signify the waxing and waning of the moon, their bucket indicating the dependence of rainfall on her phases,—a superstition extant among us yet.

Poetry has made the man in the moon its theme. Dante calls him Cain; Chaucer describes him

> Bearing a bush of thorns on his back,
> Whiche for his theft might clime so ner the heaven;

and Shakspere refers to him in "Midsummer Night's Dream" and the "Tempest."

The group of customs observed amongst both barbaric and civilised peoples at the changes of the moon, customs which are meaningless except as relics of lunar worship, will be more fitly referred to when we deal with the passage of mythology into religion, of personifying into deifying.

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Electric Lighting.—From America comes the report that about three weeks ago the wires of the Baxter Electric Light Company were crossed by the wires of the New Jersey Telephone and Telegraph Company in Jersey City, and part of the city thrown into darkness for several hours. The diverting of the powerful current from the Baxter wires to the telephone system destroyed several instruments. The Baxter Light Company say that the crossing was the result of malicious mischief, the wires being found tied together with an old woollen scarf. Experts say that the fault was caused by the sagging of the Baxter wires, as the insulator is burned off in several places. There have been two fires in Chestnut-street, Philadelphia, since the electric light wires were erected there. In both cases the firemen were greatly impeded in their efforts to get ladders up to the burning places by the electric conductors overhead.—*Electrical Review.*

## THE CRYSTAL PALACE ELECTRIC AND GAS EXHIBITION.

BOTH sections of this Exhibition have developed very considerably during the past four or five weeks, and provide plenty of food for reflection for those interested in the question of illumination, either domestic or public. The north nave is well lighted by arc lamps of the Mackenzie, Brokie, and Gulcher type. It is noteworthy that the Brokie lamp, with the principle of which several authorities have seen fit to find fault, burns with remarkable steadiness, and indicates, we apprehend, careful and intelligent engineering. The Gulcher light also burns steadily and well, a compliment we cannot by any means bestow upon the recently-introduced and much-belauded Lever lamp. Whether the fault lay with the lamp itself or resulted from carelessness in the engine-room, we are not prepared to say; but a cursory inspection of the latter did not reveal a fault there. The lamps, one could not help noticing, burnt with many shades of colour and degrees of brilliance. Among the prettiest application of the arc light it has ever been our pleasure to witness is the artificial glen at the side of the Alhambra Court, illuminated by the Lea arc lamp (exhibited by the Werdemann Company). An invisible lamp throws a beam of purest light through an opening of the glen with an exceedingly pleasing effect. It is a very near approach to a solar beam, being if anything slightly whiter in tone. The Duplex Company exhibit their arc lamp, which is well worthy of its reputation of steadiness. It is a remarkable fact that the general appearance of the arc lights this year is a decided improvement upon what was to be observed last winter. To a great extent this is due to improved workmanship in the apparatus, but perhaps to an even greater extent to the increased familiarity of the engineers with the work they have in hand. An ocean traveller would be somewhat dubious about placing himself in the care of a lad fresh from a school near which a ship had never been seen, and in which navigation had never been heard of. But this is a fair example of what has frequently taken place in the history of electric light installations. In incandescent electric lighting there is at present nothing to call for remark, unless it be that we see here, for the first time, the duplex incandescent lamp, in which there are two short incandescing filaments so arranged as to be capable of being used singly or together, either in "series" or in "parallel circuit." It is, however, questionable whether there is any real advantage in such an arrangement over the single long filament of the Edison or Swan type.

The floor of the north nave is allotted to electrical exhibits of a miscellaneous character, amongst them being a good display, by Messrs. Sanderson & Co., of lightning protectors, with one or two novelties in the way of burglar-alarms. Mr. Meyer exhibits examples of his underground system. He has a number of longitudinal grooves in a slab of glass, &c., and, laying a wire in each groove, pours an insulating material over the whole, so as to form one solid mass. The slabs with the wires may then be laid one over the other in an iron or earthenware subway or box-channel. Some difficulty, it is fancied, would be experienced in connecting continuous lengths, unless the parts are put together in the street, which is scarcely practicable. However valuable some of the claims of Mr. Meyer may be, there is at least one of them which reads somewhat amusing. He says:—"It [the system] permits the use of ribbons of copper as well as wires, *the greater surface of these being of advantage*

*in reducing the resistance.* Ribbons under other systems are impracticable, owing to technical difficulties attending the proper insulation of that peculiar section." Shades of Ohm! Thy laws no longer reign, but, doomed to ignominy, find rest only in the minds of scientists and fanatics. "Resistance varies inversely as the cross-section," was one of Ohm's simple deductions, and one which we imagined no one in these days would dare to deny; but Mr. Meyer holds that if a wire is flattened out (the cross-section remaining unaltered) its resistance is reduced.

Turning our steps southward, we observe a considerable increase in the amount of gas illumination both in the nave and in the various adjoining courts, while down the centre and along the western side are to be seen many highly-interesting displays of gas apparatus for lighting, heating, ventilating, and cooking.

In the Pompeian House there is a very good light, supplied by the Albo-Carbon Light Company. Each burner is accompanied with a means for purifying and improving the gas prior to its arriving at the burner. The result is a much larger proportion of consumed gas, compared to that which passes away unconsumed, and a relatively higher degree of luminosity. Mr. George Bower illuminates the Birmingham Court with the Lewis incandescent gas-burner and the Grimston regenerative burner. These two recently-introduced principles of gas-lighting are, however, of such paramount interest and importance, that we could scarcely do justice to them at the tail end of a general review. We must, therefore, defer for a week or two our descriptive remarks on these lights, as well as on the Clamond incandescent burner, which is exhibited by Edouard Servier, of Paris, in the Chinese Court. The light given by the Lewis burner is certainly all that could be desired, each burner consuming 8 ft. per hour of ordinary sixteen-candle gas, and emitting a light said to be equal to forty candles. Upstairs the suite of apartments so elegantly fitted out last year by various West-end upholsterers, and illuminated by Edison lamps, is now occupied by the Gas Committee. It will be remembered that last winter the rooms called forth the admiration of every visitor, the furniture being adorned by a light which readily lends itself to the artist's hands, yields a soft and steady light, and, while it in no way vitiates the air, exerts no injurious influence upon the decorations. Messrs. Atkinson & Co., of Westminster Bridge-road, are the present furnishers, and have apparently embellished the rooms to the fullest extent of their power, the light being supplied by gas consumed in the Grimsten and Sugg burners. The effect is pretty and everything tastily arranged, but with the greatest desire for impartiality it is impossible to deny the palm to last year's adornment, thanks to Mr. Edison.

Beyond the Gas Committee's Exhibit there is nothing to be seen in the gallery, which, remembering the disappointment experienced and expressed by many exhibitors located there last year, is scarcely to be regretted.

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The electric street fire alarums placed throughout Glasgow were used 152 times to intimate the outbreak of fires during last year, and in 45 instances were the means of calling out the brigade unnecessarily—15 of which alarms were given with good intent, nine through contact with other wires, and 21 thoughtlessly or mischievously.

The foreign settlement at Shanghai has for some time been lighted on the Brush system, but the Chinese governor of the district has addressed a letter to the senior Foreign Consul, requesting a removal of all the electric lamps. He has read, he says, in translations from European papers, that terrible accidents have arisen from electricity. He has, therefore, strictly forbidden his own countrymen to use it, and has peremptorily ordered those who have already adopted it to discontinue it forthwith.

## "CLERK" OR "CLARK."

By E. A. Freeman, LL.D., D.C.L.

THERE is one word on which I wish to speak a little more at large, as a clear instance in which the schoolmaster or the printed text or some other artificial influence has brought about a distinct change in pronunciation. The word "clerk" is in England usually sounded "clark," while in America it is usually sounded "clurk." I say "usually," because I did once hear "clurk" in England—from a London shopman—and because I was told at Philadelphia that some old people there still said "clark," and—a most important fact—that those who said "clark" also said "marchant." Now it is quite certain that "clark" is the older pronunciation, the pronunciation which the first settlers must have taken with them. This is proved by the fact that the word as a surname—and it is one of the commonest of surnames—is always sounded, and most commonly written, "Clark" or "Clarke." I suspect that "Clerk" as a surname, so spelled, is distinctively "Scotch," in the modern sense of that word. Also in writers of the sixteenth and early seventeenth century, the word itself is very often written "clark" or "clarke." But of course "clerk" was at all times the more clerkly spelling, as showing the French and Latin origin of the word. It is plain therefore that the pronunciation "clurk" is not traditional, but has been brought in artificially, out of a notion of making the sound conform to the spelling. But "clurk" is no more the true sound than "clark"; the true sound is "clairk," like French "clerc," and a Scotsman would surely sound it so. "Clark" and "clurk" are both mere approximations to the French sound, and "clark" is the older, and surely the more natural approximation. The truth is that we cannot sound "clerk" as it is spelled; that is, we cannot give the *e* before *r* the same sound which we give it when it is followed by any other consonant. We cannot sound *e* in "clerk" exactly as we sound *e* in "tent." This applies to a crowd of words, some of Latin origin, in which the spelling is *e*, but in which the sound has, just as in "clerk," fluctuated between *a* and *u*. The old people at Philadelphia who said "clark" also said "marchant." And quite rightly, for they had on their side both older English usage and, in this case, the French spelling itself. The sound "murchant" has come in, both in England and in America, by exactly the same process as that by which the sound "clurk" has come in in America, but not in England. In these cases the words are of Latin origin; so is "German," which people used to sound "Jarman"—as in the memorable story of the Oxford University preacher who wished the "Jarman theology" at the bottom of the "Jarman Ocean." But the same thing happens to a crowd of Teutonic proper names, as Derby, Berkeley, Berkshire, Bernard, Bertram, and others. In these names the original Old-English vowel is "*eo*"; the modern spelling and the different modern pronunciations are mere approximations, just as when the vowel is the French or Latin *e*. One has heard "Darby" and "Durby," "Barkeley" and "Burkeley"; and though the *a* sound is now deemed the more polite, yet I believe that fashion has fluctuated in this matter, as in most others. And fashion, whether fluctuating or not, is at least inconsistent; if it is polite to talk of "Barkshire" and "Darby," it is no longer polite to talk about "Jarman" and "Jarsey." But in all these cases there can be no doubt that the *a* sound is the older. The names of which I have spoken are often spelled with an *a* in old writers; and the *a* sound has for it the witness of the most familiar spelling of several of the names when used as surnames. "Darby,'

"Barclay," "Barnard," "Bartram," all familiar surnames, show what sound was usual when their present spelling was fixed. Tourists, I believe, talk of the "Durwent" (as they call the Dove the "Duv"); but the Derwent at Stamford-bridge is undoubtedly Darwent, while the more northern stream of the name is locally Darwin, a form which has become illustrious as a surname. Now in words of this kind, while British use is somewhat fluctuating, I believe that America has universally decided for the *u* sound. But there can be no doubt that, whether in England or in America, the sound of "Durby" or "Burtram" is simply an attempt to adapt the sound to the spelling, while "Darby" and "Bartram" are the genuine traditional sounds.—*Longman's Magazine.*

[In nearly all these cases, the genuine original sound is not "a" as in "far," but "a" as in "fare." The point is discussed in an article which I wrote for the *Gentleman's Magazine*, now in the press for "Leisure Readings," Knowledge Library.—R. A. P.]

## STAYS AND STRENGTH.

By "An Observer" and Rich. A. Proctor.

THE result of your own experiment in tight-lacing is solid ground compared with the theories and analogies in which this subject had been previously swimming. And undoubtedly it proves what the sight of every fat but tight-laced woman proved before, viz., that it is not an infallible remedy for corpulence. But I have looked at, I believe, all the letters formerly published on it to see if any recommended it as such, and I do not find one that goes beyond saying that the writer had found his or her own size and weight permanently reduced by it, and, therefore, it was worth trying by others who wanted such reduction. Most of them, indeed, said they had originally tried it for some other reason, and had incidentally derived that benefit also which you did from going to America.

(2). I do not doubt that in the least, though I cannot remember the same thing happening to any of my own acquaintance, and one came back fatter who was thin before.

(3). But has it ever occurred to you to reflect how Knowledge would have been writing on this subject for the last few months, if you had happened to be one of those whose experience was different from your own, as of course the Editor of Knowledge might have been? I will not pursue that inquiry, but leave it to the meditation of our readers.

(4). I know nothing in the world of the army-surgeon whom I quoted, except that he wrote like a practical man, simply giving the result of an experiment which he began just as you did, only he found himself so much better for it that he continued it, as sundry other writers did. And, in spite of your contempt for him, I must give the surgeon, at any rate, credit for understanding his own constitution better than you do for him—and indeed, the non-medical experimenters, too, especially as several of them said that their health always relapsed whenever they gave up their stays, though one or two added that they find them only necessary for health for a few hours in the morning. Nor can I see anything so very funny in his liking to contract his waist to 23 in., as he finds himself better for it, and does like it, like all the other advocates of it, from their own experience. Such a waist will measure at least 27 in. over any male dress that is worn now; and any tailor will tell you that there are many tall men with natural waists from that size down to 24 in. He gave his height as 5 ft. 7 in., which is not tall; and his circumference was trumped by another man of the same height, who said he had been for ten years smaller by an inch in his stays.

(5). I am quite unable, even with the help of your reference to your own case, to understand your reiterated medical conclusion, that "if a man finds himself better in stays, it shows that they are weakening"—*i.e.*, if a man finds himself better for any treatment, that proves that he is worse for it, even though he relapses into greater *worseness* whenever he gives it up. I give that up, as a piece of logic utterly beyond me.

(6). I must leave you and the American doctor to agree on what you both really mean as to the tight-lacing of American ladies (which I had heard and read of before) compared with ours. You contradict him on one point, and so explain him away on another that I give it up in despair.

(7). The letter of G. C. S. is in no respect worth answering. An Observer.

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(1). Nay,—"fat and tight-laced women" notwithstanding,—I believe tight-lacing in the manner recommended by "An Observer" is a remedy for corpulence. Even my own experiment would, very probably, if continued long enough, have proved that. I simply could not afford to pay the price,—torpid liver, impaired respiration, permanently weakened abdominal and lumbar muscles, with some scarce more pleasant etceteras. There are other pretty sure ways of diminishing corpulence, which are not much worse.

(2). I believe my American experience much more common than that of "An Observer's" acquaintance. I suppose two or three hundred cases have come under my notice in the multitudinous converse I have had with travellers. In the great majority of cases there is loss of weight; in a few no change; and in a very few the contrary experience has been described to me. An Englishman who goes to America only for a holiday may take things so easily as to come back fleshier. But America is a large place any way,—some of its States severally larger than European countries,—so that locality may have something to do with the matter.

(3). After meditating on what would probably have happened if my experience had been the reverse of what it has been, I feel constrained to admit that, as a general rule, "If your aunt had been a man, she would have been your uncle." "An Observer" does not, of course, mean that I have not let both sides have their say; for I have. For every letter on his side for which room could not be found, there have been about a dozen on the other in similar plight. Oddly enough, though so many years have passed since the corset cure for corpulence, indigestion, &c., &c., was prescribed, and hundreds must have tried it, besides them who then advocated it, I have not received *one single letter* giving a favourable account of its efficacy.

(4). I felt well assured "An Observer" knew nothing of the army surgeon. I fancy if he had ever met that surgeon he would have written differently about him. I have a strong belief, amounting almost to conviction, that most of those who gave their own experience, as they said, were of the "tailless fox" order. They had fallen into the trap, and being no longer able to exist comfortably without their corsets, tried to persuade others that they liked to wear them, and would not, even if they could, recover their former freedom. I set against their pretended experience the results of very wide-ranging inquiries of my own. I have come in my travels (lecturing and otherwise) across hundreds of men with whom I have conversed about

such subjects as we are upon. I have scarcely ever had an hour's talk with a medical fellow-traveller without ascertaining what his experience had taught. And I assert with the utmost confidence (knowing that mere chance cannot have brought me in contact only with *one* set, if opinions were fairly divided) that the overwhelming weight of experience, and consequently of opinion, is against tight lacing.

(5). Has "An Observer" *never* heard of remedies which are worse than the disease? Does not a drunkard feel the better after a drink; and is he not in the long run the worse for it? The drunkard's "morning nip" and the tight-lacer's "morning nip" are pretty much on a par, I take it. It sounds even worse logic than what "An Observer" thinks so bad, to say—for example—"a man sleeps the better for a narcotic, and therefore he sleeps the worse for it"; but it happens to be a fact, and therefore the logic must really be sound, whatever it may seem to be. Such cases are common and well known. One may even infer that, as a general rule, if a man feels the better for any artificial support, stimulant, soothing treatment, or the like, he will probably be the worse in the long-run for its systematic use.

(6). I agree with everything Dr. Dio Lewis has said about the tight-lacing of American ladies. On what point "An Observer" supposes I contradict Dr. Lewis, I fail to see. Dr. Lewis remarks that some American ladies *say* nineteen inches waist measurement is immense, and I note that American ladies do not *think* so; it is tolerably clear that Dr. Lewis knows that very well. He suggests it very neatly. I will undertake to say not one of his American readers (and he was writing for Americans) misunderstood him, as "An Observer" seems to have done. [I may correct here an erratum in the letter of "G. C. S." At line 13, for "19" read "14." (The fault was not wholly with the printers, as the "4" looked very like a 9.) Of course, a natural feminine waist may be 19 inches, while a 14-inch waist would be monstrous (in the true sense of the word.)]

(7). "An Observer" should not be surprised if "G. C. S.," like hundreds of ladies who have written to us on the subject, is not over well-pleased to see a cause so stoutly advocated, which, were it successfully pleaded, would condemn her sex to the continuance and even increase of miseries from which a way of escape seems opening.

(Note.)—Referring to my remarks, p. 51, I note that on reference to my diary I find my weight in the autumn of 1875 was 14 st. 7 lb., not 14 st. 3 lb.—the 3 lb. belonged to the American way of recording weight, making mine 203 lb. at that time—or, *minus* clothing (summer), about 194 lb.: reduced 39 lb., or by one-fifth part, in the spring of 1876. In reply to many queries, the height of American lady mentioned on p. 51, is about 5 ft. 4 in. When I spoke of dresses not fitting well after corset removed, I meant that they were then too loose, and did not set perfectly round waist. It may interest many ladies to learn that the last-named effect is entirely cured by the arrangement advocated by the Rational Dress Society, a still more marked increase of comfort following after that change than after the mere disuse of corset. I learn on excellent authority that the new mode is much more comfortable, much lighter, much warmer, than the old; yet it is *to all appearances the same* (unless a lady should choose otherwise), a point on which I think the Rational Dress Society should dwell more than they do; for many suppose the new dress to be something *outré* and remarkable. It may comfort "An Observer" to know that a lady may derive all the benefits of lightness and warmth which the new dress gives, and yet, should she so please, may squeeze herself, to her heart's content and her liver's discomfort, in the tightest possible corsets.

Richard A. Proctor.

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P.S.—Feb. 5. "Dr. Lewis's closing words," in capitals, are truly awful—to those who prefer observations to observation. Those who prefer the latter must have known, as I have, numbers of women with numbers of healthy children, and yet manifestly guilty of tight lacing, and no worse for it in any way. I mentioned the Empress of Austria before—a tall woman with still a very small waist, formerly 16 in., and grandchildren, and a great rider still. A near relation of mine used to say her waist was 18 in. when she married, and she had eleven children, most of whom have already lived to more than sixty, in unusually good health; so had she till she died at nearly eighty. One of the most apparently tight-laced girls I ever knew has a good many children, I believe, and I never heard of either her or them being in bad health. I could easily mention others—indeed, such is the perversity of men, that I am afraid small-waisted girls get, not less, but more married than others. Dr. Lewis has evidently one national quality in perfection, of "going the whole hog."—An Observer.

[Feb. 6.—To all which, the reply is that small waists and tight-lacing are very different things. I can cite four instances within my own circle where "An Observer" would have suggested "manifestly tight-lacing," but where there was no lacing at all—simply small natural waists, which always have been and always will be admired. One lady, whose waist was 19½ in. before marriage, mother of twelve children (including twins); another, whose waist was 19 in., mother of four children; two others, natural waists 18 in. and 16 in., one married, and the other most certainly *not* one who should be advised (either in capitals or small type) not to marry.—R. P.]

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## CORPULENCE.*

(*Continued from p.* 73.)

MANY of the persons who complain of their flesh could relieve themselves of part of it by two simple expedients, viz., eating less and taking more exercise. This, however, requires too great a sacrifice on their part; they are like the people who want to get rich or learned without exercising the amount of self-denial necessary to accomplish the desired end.

In early Greece, gymnastic exercises had for their express object the prevention of corpulence. A huge padding of fat not only shocked the highly-developed æsthetic sensibility of this richly gifted people, but was most justly regarded by them as a hindrance to corporeal robustness.

It is well known that work-horses are seldom fat, and persons of active habits avoid excess of flesh. But not only does a quiet life favour corpulence, but corpulence favours quiet, for the fat man finds it impossible to take much exercise.

Before considering the diet most favourable to the cure of corpulence, we must ask whence comes human fat. The views of physiological chemists have undergone much change since the days of Liebig, who considered the carbohydrates (sugar and starch) to be the fat producers. The more recent physiological view regards the greater portion of the fat store as probably a product of the decomposition of the albumen in the food, but some of the fat eaten is deposited in the tissues directly. The magnitude of this store is primarily determined by the amount of food taken, because the store of fat at any time laid up in the animal body is derived from the nutriment assimilated by the organism. It does not follow from our first statement that if a man lived entirely on albumen he would get fat, because a large portion of the albumen would be consumed in supporting life, and only the residue unconsumed could be laid up as reserve. But if farinaceous food and sugar

* From the *Scientific American*.

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(carbo-hydrates) be taken with the albumen, the former protect the latter from burning up, and thus favour the formation of fat, although we have no proof that they can themselves be converted into fat. To make a familiar comparison, a person who receives a very small salary and board will be able to put more money in the savings-bank than one who receives a larger compensation for his services, but has to pay his own board. The food which the former receives from his employer cannot be deposited in the bank, but it enables him to preserve intact whatever cash he may get. This protecting influence of the carbo-hydrates led early chemists to mistake them for fat producers.

Both the quality and quantity of food taken are of importance in the treatment of corpulence. Starvation will reduce the flesh, but it should *never* be resorted to, as it produces weakness in every organ, and leads to the worst results. On the other hand, the quantity of food eaten should be as small as is consistent with health and with satisfaction of the natural appetite. As regards the kind of food, the following should only be taken in small quantities:—Bread, milk, eggs, potatoes, carrots, rice, buckwheat, sweet soups, sugar, mutton in any form, beef-steak, salads with oil, dessert dishes, and wine jelly. The following should be almost entirely avoided:—Butter, cream, fats, sauces, pork, sweet pastry, confitures, creams, ices, chestnuts and other nuts. For beverages tea and coffee may be taken with little or no milk and sugar, but chocolate and cocoa are to be avoided. Beer and strong alcoholic liquors must be given up, but sour wines diluted with water are permissible.

The first person who ever followed out for a year the strict dietary laid down by his physician was William Banting, who reduced his weight 46 pounds (from 202 pounds to 156 pounds) and his circumference by 12¼ inches in that time. This treatment, which was invented by Harvey, has since been known as "Bantingism." The details of his *menu* may be found in most medical books. Although frequently attempted, it has rarely been found so successful in other cases. There is no doubt, however, that any intelligent person who is willing to impose some restraint on his appetite, and avoid the forbidden foods and drinks mentioned above, and take regular exercise, may materially reduce his own weight and bulk.

(*To be continued.*)

## Reviews.

### THE VAST AND THE MINUTE.*

AMONG the most attractive of the treatises on science which we owe to the French school of popular science teaching—the works of Guillemin, Flammarion, Figuier, Pouchet, and others—there is not one more suggestive and impressive than Pouchet's "Universe of the Infinitely Great and the Infinitely Little." There is a charm in such a work as this peculiar to itself. A well-written popular treatise on Astronomy, Geology, or Biology, on Electricity, Chemistry, or Physics generally, teaches striking lessons about the wonders of nature in specific fields. But such a work as Pouchet's "Universe" brings so forcibly before the thoughtful reader the infinite variety of the universe, that he must be dull indeed who is not awed by the impressive lesson. The poet who tells us that "the undevout astronomer is mad" (without precisely noting what sort of devotion he means) adds the singular statement that,—

> In the small, men seek out God,
> In great, He seizes man.

But the saying might be more truthfully reversed. In the great, man seems lost: he trembles as he stands before

> The great world's altar-stairs
> That slope thro' darkness up to God.

In the small, he seems to trace God's hand. A poet, who died more than a quarter of a century ago, said of a tiny flower—

> For me such spell, fair gem, thou hast,
> Thy magic power conveys,
> My soul through countless ages past,
> Back to Creation's days.

Modern science cannot look back so far; but the story which Mr. Grant Allen tells us in these pages is not less impressive that it speaks of no beginning which science can recognise. The story with which M. Pouchet deals is even grander; because he appeals at once both to the great and to the small—nay, to what is practically to us the infinitely great and the infinitely small. His lesson is the "old old lesson," which the illimitable heavens and the tiny flowret have alike taught to all who have ears to hear, and eyes to see, and hearts to understand,—

> Spirit of Nature, here—
> In this interminable wilderness
> Of worlds, at whose immensity
> E'en soaring fancy staggers—
> Here is thy fitting temple.
>
> Yet not the lightest leaf
> That quivers to the passing breeze
> Is less instinct with thee.

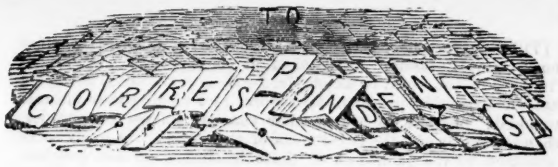
How M. Pouchet tells the wondrous story we must refer our readers to his book to learn. With happy aptitude he selects all that is most striking in the great and small, all that appeals most to the imagination. From the mountain to the sand-grain, from the mammoth to the microscopic animalcule, from the sun to the atom, throughout the world of vegetables, the insect world, the present and past time, he ransacks the whole storehouse of knowledge to supply his "modern instances" of the infinitely great and the infinitely small, and to enforce the lesson which all nature has to tell. It were easy to note errors in matters of detail, easy to indicate omissions and deficiencies; but such a work could hardly be free from error, and could not possibly be free from omissions. Regarded as a whole, it is admirably done. The volume is illustrated by 270 excellent engravings, is handsomely bound, and well got up altogether. In this, the seventh edition, the matter relating to comets and meteors is considerably out of date, and the researches of Pasteur should have found a place here. But most of the matter is "not for an age, but for all time," and independent of editions.—R. A. Proctor.

* "The Universe; or, the Infinitely Great and the Infinitely Little," by F. A. Pouchet, M.D. (Seventh Edition. London: Blackie & Son.)

Mr. Justice Fry made an order on Friday last for the winding-up of the Phœnix Electric Light and Power Company, under the supervision of the Court.

Thunderstorm.—During a thunderstorm in the neighbourhood of Pontypridd on Tuesday week, a house, occupied by a farmer, was struck three times by the lightning. One flash passed down the chimney-stack and knocked down a mantelpiece, another knocked away a portion of the building, and, passing into an out-house, killed five cows, and a third smashed the bedroom window.

Prize Electrical Essay.—A prize of £100 for the best essay on the utilisation of electricity for motive-power is offered by the Society of Arts. Preference is to be given to that essay which, besides setting forth the theory of the subject, contains records with detailed results of actual working or experiment. The society reserves the right of publishing the essay.




"Let Knowledge grow from more to more."—ALFRED TENNYSON.

## Letters to the Editor.

*Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.*

*All Editorial communications should be addressed to the* EDITOR OF KNOWLEDGE; *all Business communications to the* PUBLISHERS, *at the Office, 74, Great Queen-street, W.C.* IF THIS IS NOT ATTENDED TO, DELAYS ARISE FOR WHICH THE EDITOR IS NOT RESPONSIBLE.

*All Remittances, Cheques, and Post Office Orders should be made payable to* MESSRS. WYMAN & SONS.

*The Editor is not responsible for the opinions of correspondents.*

NO COMMUNICATIONS ARE ANSWERED BY POST, EVEN THOUGH STAMPED AND DIRECTED ENVELOPE BE ENCLOSED.

### SUN-DIAL OF AHAZ.

[702]—There is not the least necessity for supposing Hezekiah's parhelion to have differed in position from the commonest sort, such as my Portsea ones, if we suppose it at the same time of day, 1h. 30m., and in December or January. Both accounts, indeed, almost necessitate that very time of day; for they say that the shadow (or the sun, *Isa*) was "brought back ten degrees, by which it had gone down;" implying, if strictly taken, that this was the whole amount it had declined, or that the shadow came back just to the meridian. If the "degrees" then were fortieths of a quadrant (and forty occurs so constantly in the Old Testament as to be the likeliest number by far), the hour must have been half-past one, the same at which our Portsea display became overclouded, and the left-hand mock sun was due south. Having seen proof that the effects all ceased while the sun was higher than about 37°, I vaguely inferred that in a low latitude they would only be possible early or late in the day. But the mid-winter sun at Jerusalem only reaches 35° on the meridian, about 5° less than at Portsea on March 29, so that for at least a month before and after midwinter the sign was possible at noon.

These degrees, equal to nine of our minutes, must be the earliest artificial time-measures on record, as hours are said to be named by no writer before Daniel, and were at first but three to the quadrant though six are made, as now, in the eight dials on the Tower of the Winds at Athens, and the old Greek dials in the British Museum.

E. L. G.

[Several correspondents mistakingly suppose that "E. L. G.," in explaining by what simple natural means the shadow might go back, proposed to dispute the occurrence of anything miraculous. It should be obvious from his first letter that this is not the case. Of course, if the event happened as described it was miraculous, whatever the explanation. Equally of course, many will prefer to believe that while such a phenomenon was witnessed in Hezekiah's time, it was only long after that the story assumed its present form, according to which the going back of the shadow was promised beforehand.—R. P.]

### WEARING STAYS.

[703]—As the father of young daughters who, like knowledge, are "growing from more to more," I have followed with great interest the letters in KNOWLEDGE about corset wearing, and the thought has occurred to me that perhaps you could suggest a rational way of dressing girls. Their mother says that without "stays" they will simply be "lumps." W. WATERHOUSE.

[The discussion of this subject began with the advocacy of tight-lacing. The question is one of extreme importance—of vital importance. A writer says "Men are not interested in it"; but men (of sense, *bien entendu*) are very much interested in it. I have myself no suggestions to offer, simply because I regard the matter as one for women to deal with. The wife of the just-mentioned writer says she "*will* wear stays" (presumably tightly-laced ones), and he says "she is quite right." But, putting mere chaff of that sort on one side, I can only note that quite a large number of ladies, whose experience of the "Rational Dress" system has reached me, speak of it as much warmer, much lighter, much better-looking, for women who by nature have waists—but I fear it is open to the objection that a "bunchy" woman would look worse in the "rational dress." Such is the verdict of the feminine authorities whose opinion has reached me.—R. P.]

### WEATHER PREDICTIONS.

[704]—An evening paper writes as follows:—"The authorities of the Meteorological Office have at length given up the weather in despair. For many months they have been singularly unfortunate. There was a time when it was otherwise. Personal observation of the daily forecasts led me at one time to regard them with wondering confidence, but for at least six months things have gone wrong, and it came to pass that the nearest approach to a safe forecast of the weather was to count upon the reverse of the prediction from the meteorological department. On Sunday night the office gave it up with something like a cry of pathetic despair. They declared that a definite forecast was impossible, but very unsettled wet weather was likely to prevail generally. This looked like treading on sure ground. A man who at this season would predict wet weather as likely generally to prevail could not be called rash; but here again the hapless Meteorological Office is ludicrously in the wrong; yesterday was, for London, a phenomenally clear and sunlit day, and similar weather is reported all through the southern districts."—*London Paper.*

Is it not time now that this farce is ended, and the money that has been wasted annually upon this useless office be in future saved to the revenue of this overtaxed country? G. I. L.

### OUR FOREFATHERS.

[705]—Would you kindly assist me out of a perplexity? A short time ago, I read in the *Daily Telegraph* that, according to calculations made by an Italian statist, every person now alive is entitled to claim nearly one hundred and forty thousand billions of ancestors by going no further back than the year one of the Christian era, taking three generations in a century, or about fifty-seven in all; basing the calculation on the fact that every person has, or has had, a father and a mother, and again that father and mother had the same progenitors, which were of necessity doubled with every generation as we go further back. Now, there is nothing to be said against the correctness of this calculation, but then we come to the astounding fact that such an enormous number of ancestors is claimed by a single person, whilst even now, after 1882 years have elapsed, during which period the population has rather increased than decreased, there are only about one thousand millions of people alive. But this is not all. Our ancestors living in the year one had also fathers and mothers, and I can't see what can stop us going further and further back for four thousand years more, when we come to the time of the beginning of the world, when there were actually only two people in existence.[!] And mind, Mr. Editor, this is the result of starting with only one person, whilst there are one thousand millions besides who can make the same claim. Do you wonder that I am perplexed? Please to help me to clear it up, and oblige, A CONSTANT READER.

[If a "Constant Reader" will consider the case of, say, twelve married couples, starting a colony, in a place to which no others ever come to stay, and carefully note the effect of natural increase resulting from intermarriages among the descendants, he will see that if in a generation the population doubled—say three generations in a century—then, in a thousand years, the population would consist of some 26,000,000,000, all descended from twenty-four persons. Yet each person would be theoretically descended from 2,150,000,000 ancestors, the number being made up by the varying *ways* in which each of the original twenty-four is related to each of his descendants in the thirtieth degree. When first-cousins marry, to take a simple example, their children have only six instead of eight great-grandparents; but one great-grandfather is (or may be) father's father's father, and mother's mother's father. If two brothers marry two sisters, and a son by one marriage marries a daughter by the other, the children of this last marriage have only four great-grandparents; but each of these is doubly a great-grandparent. When a longer range of generations is taken, these relationships not only may become, but do become, much more complicated. Thus the chances are that any person casually met in society is not only a cousin far removed, but a cousin in various degrees of removal, according to the way in which cousinship is estimated, and a cousin also in hundreds of different ways. It is almost infinitely unlikely that, if all the relationships could be traced back a hundred generations, no cousinship would be found, in the case even of a man in very different rank—much higher or much lower.—R. P.]

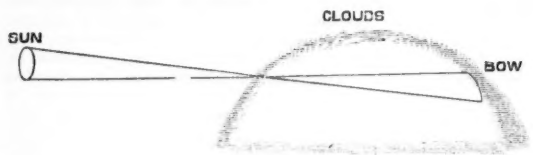
XUM

## A CURIOUS RAINBOW.

[706]—Yesterday morning (Jan. 21, 1883) I observed a rainbow—one similar to which I do not ever remember seeing before, at least as regards apparent conditions and definition.

The morning was fine and frosty, and fairly clear, the country round about being visible for a distance of about ten miles, and there was certainly neither any appearance of rain not yet of snow visible between either horizon. At about half-past nine o'clock I observed a bow in the north-western part of the sky. The different colours were barely distinguishable, and I at first thought that it was a freak of nature in the shaping of the clouds.

Now, the sun was shining through a thin layer of clouds (cirrus, I think), which covered the whole sky more or less, and I suppose that the sun shining through those clouds in the east would cause the rainbow to be reflected on the clouds in the west. If this is the case, however, how is it that similar rainbows are not oftener seen? If this is an uncommon occurrence, and I have not given the right definition of its cause, I have no doubt you or some of your readers will be able to explain.




The enclosed *rough* drawing, made of course irrespective of size or distance, will show more clearly what I mean.

The rainbow lasted for *more* than an hour and a half.—Yours sincerely, W. H. M.

## MISTLETOE.

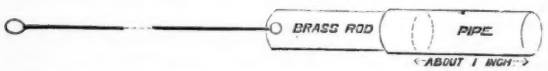
[707]—Mr. Grant Allen, in his most interesting paper on the "Mistletoe," seems to me to have left out one of the chief ways in which the plant is propagated. Any one who has watched a canary or any small cage bird feeding must have seen the bird, when anything stuck to the outside of its beak, wipe its beak on the perch. Now, when a bird is eating mistletoe berries, what is more likely than that the seeds should get stuck to its beak by the very viscid pulp? In this case the bird will be almost sure to wipe the seeds off its beak on to a branch of a tree, where the seeds will be left ready to germinate. W. H. Bansall, B.A.

## SLEET AND SNOW.

[708]—On Wednesday evening, Jan. 24, between eight and nine o'clock, I happened to be out in the rain, or rather sleet, which was falling, when suddenly the character of the downfall changed, and for about five or six minutes snowflakes of remarkable size fell instead of the sleet; the flakes, or perhaps accumulation of flakes, were from 1 to 2½ inches in length, and ¾ to 1¾ in breadth; was it not a rather singular phenomenon? I could not see if the delicate star-forms were plainly visible or not, being unable to examine them in the light. J. Lord.

## ACOUSTIC EXPERIMENT.

[709]—The following simple experiment suggested itself to me as an illustration of the way the spectroscope is used to show whether a star is approaching the earth or moving from it. I soldered a short piece of ⅜-in. brass tube to a brass rod (in order to give it weight), filed up the open end square, and tied the rod to a piece of string about four feet long.




Now, when the end of the string was held in the hand and the pipe swung rapidly round, like a sling, it emitted a note, which, by a person standing at a little distance (in the plane in which the arrangement was turning), was heard to alternately rise and fall in pitch, being higher when the pipe was approaching, and lower when it was receding from the observer. It will be easily seen how this illustrates the use of the spectroscope referred to.

Andrew Boyd.

## GREAT PYRAMID.

[710]—Adverting to Mr. Wm. M. Flinders-Petrie's excavations at the "Great Pyramid," as detailed in the appendix (B) to Mr. Proctor's recent work, in which Mr. Petrie is represented as saying that the Pyramid "proves to be several feet smaller than hitherto supposed;" I write to ask whether you can inform your readers when the result of "the paper work of the survey," is likely to be submitted to the judgment of those interested in the question, whether viewed from the standpoint taken up by Professor Piazzi Smyth and his following, or that taken by Mr. Proctor.

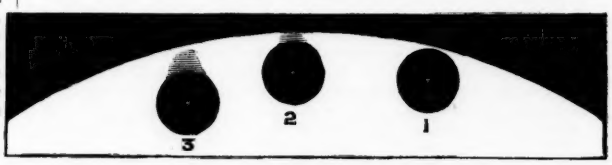
If Mr. Petrie's labours substantiate the fact that there is an error of several feet in the hitherto-recorded measures, not only will, as Mr. Proctor remarks, the relations supposed to connect astronomy with the structure go overboard, but it will be difficult to readjust the pyramid measures of the cubit and inch, so as to make them fit into the "inch for the year" theory of measurement of the passages, and thus inflict a heavy blow and great discouragement upon the prophetic teachings and testimony claimed for this wonderful building—claims which have received the support of many, and which have invested it with a halo of sanctity almost amounting to worship. An Inquirer after Truth.

[The greater astronomical relations remain, however, and the Pyramidalists will simply shorten their cubit.—R. P.]

## TRANSIT OF VENUS.

[The letter from which the following is taken was marked "private," but we feel sure our correspondent will not object to our quoting these particulars.—Ed.

[711]—My telescope is only a small one—3½ in.—by Cox, of Devonport, but with a medium power of 150 both sun and planet were seen very clear indeed, until they set in a bank of clouds very near the horizon. A few light clouds only passed over them occasionally during nearly two hours, through which the disks of both sun and planet were seen well defined without a coloured glass. Before and after the first contact the disks were beautifully clear; and when the planet separated from the sun's disk inside there was no sign of a black drop, or anything to break




the clearness of both disks, which separated as clearly as I have shown above in No. 1. Very soon after a distinct but very faint pink colour filled up the space between, which got a little brighter when in about the position of No. 2, the brightest colour being planet. It then gradually died away, but there were traces of it, though very faint, when the space was fully equal to the planet's semi-diameter. Thinking at first that my eye might have deceived me, I asked two or three gentlemen to look carefully at it, and they also saw it clearly.

There may be nothing unusual in this, but as I have not seen it noticed in any report of the transit, I think you may like to have the account of it.—Yours, &c., B. J. Sulivan, Admiral.

[712]—Your article on the "Photographic Eyes of Science" was evidently written last year. Would it not be well to have a statement to that effect printed in the next number of the magazine? Otherwise you may find yourself made responsible for a statement that the transit of Venus is to be repeated *next* December (see top of page 446). The announcement might run thus:—"In compliance with a general request, the highly successful performance will be repeated (positively for the last time this century) in December next. Early application for reserved seats should be made," &c., &c. This would be as great a windfall to the "science" (?) columns of society papers as the "menacing comet" with which you were credited. It could hardly surprise you next to find yourself possessed of powers like the man in "Uncle Remus," who was "gwine ter fix up der wedder." W.

## THE EDELWEISS.

[713]—A Corkonian will be thankful to any peruser of Knowledge who may happen to be versed in botanical lore to acquaint him with the scientific nomenclature, &c., &c., of the above-named Alpine plant.

## LOGICAL PUZZLEDOM.

[714]—In my last letter I partly confounded assertion with assumption, but that hardly touches the question at issue. As I understand the *reductio ad absurdum* argument (which is little mentioned in logical text-books, though so much used by Euclid), *we make a supposition consistent with one of the premises, and proceed to test it by the remaining premise* or premises, and when it is "eventually" contradicted by the latter we get the *reductio ad absurdum*. We make no questionable wider assumption than is necessary for our purpose, nor any assumption which, before it is contradicted by other premises, involves an absurdity in itself.

In the solution of the logical puzzle (p. 7, No. 62) the assumption "for all X's to be Z's, &c.," is a wider assumption than is necessary for the solution, the assumption "for *all the* X's *in question* to be Z's, &c.," being sufficient; and the assumption uncorrected also involves an absurdity in itself, before it is contradicted by other premises; being inconsistent with the first premise with which it must necessarily be consistent; all the X's may be more in number than the Z's, and to assume that all the X's are Z's is to assume that a greater number may be equal to a smaller, which is absurd.

It is very difficult to avoid logical pit-falls. Probably every one who attempts reasoning stumbles among them more or less. I shall not beg the question as to logic being the science which teaches how to find truth. I take your statement as correct that "men find truth by observation, experience, and reasoning," and I refer to all the important works on Inductive and Deductive Logic, especially the works of Mill, Jevons, Bain, Fowler, &c., who all teach how observations and experiments are made, correctly and incorrectly; how experience is gained, and how people reason, correctly and incorrectly. [So far right; but in what follows the question is begged again.—R. P.] What more can be done to teach people how to find truth than to show them the right and the wrong way? [This is just what formal logic does not do, any more than the criticism which points out errors or beauties in a drawing teaches how to draw.—R.P.] When the evidence as to the correct method of finding truth is convincing, the mind involuntarily assents to it, as to all other convincing evidence, and to a certain extent, at least, depending on the person's intellectual habits, acts according to the correct method.

Inductive logic is certainly the more important, though the use of deduction for the purpose of verification must not be underrated. Hamilton's extension of the logical forms is somewhat puerile, requiring as it does for its completion what De Morgan terms the *spurious* proposition—"some X's are not some Z's"—a proposition which is necessarily true, unless there is only one X, which is also the one Z.

Deduction, or formal logic, has been greatly extended and generalised since the time of Whately, especially by De Morgan, Boole, and the lamented Professor Jevons, whose logical "abecedarium" and logical machine, enable one at once to solve complex logical problems which cannot be solved by unaided mental processes.

THOMAS COMMON.

[Mr. Common's account of the *reductio ad absurdum* is not strictly correct. We always in applying this method have the conclusion in view,—we make such a supposition as *must* be sound if the conclusion we wish to establish is unsound,—and that is the only condition we have to consider; consistently with this we may assume anything. (It is not sufficient to assume something which is merely inconsistent with the conclusion.) This kind of argument belongs as much to logic as to mathematics,—in fact, underlies a large proportion of formal logic. In the present case we have to show that "some X's are not Z's," and the only admissible assumption for the *reductio ad absurdum* is that "all X's are Z's." Mr. Common's remarks on this point are simply incorrect.

Logic shows how people reason correctly and incorrectly; but it may be doubted if it ever taught more. The great observers, experimenters, discoverers, and inventors, reasoned correctly independently of formal logic, and afforded the logician some of his best examples. But the best logicians have not always reasoned correctly, witness Jevons' arguments about the exhaustion of coal, and about sun-spots, and commercial crises. Logic may be compared to criticism. Learning what constitutes correct drawing or painting is not learning to draw or paint correctly.—R. P.]

## RIGEL.

[715]—Will you kindly inform me whether Rigel is a coloured star. An old friend of mine tells me that fifty years ago Rigel was considered by astronomers to be red. Is that so?

Although I live at Streatham, I hope you won't visit on me the sins of the district, for I am not one of those who made that absurd request mentioned by you in your "Lecture Notes." SOLARIUM.

[Like Mr. Webb, I always see a blue tinge in this star. Others consider it yellow.—ED.]

[716]—I am an engineer and millwright by trade, and am about to leave Old England either for America or Australia, to see if the climate will benefit me for a bronchial complaint, and seeing from KNOWLEDGE that you have travelled in both places, can you kindly give me any advice as to what parts of either country will be most suitable? I have thought about Minnesota, in America, and New South Wales, in Australia. R. H. M.

[I cannot advise "R. H. M." better than by suggesting that he should obtain the excellent little book on emigration published by Messrs. Wyman & Sons.—R. P.]

## NATURE'S REST.

[717]—In your number of January 19 you say, "When nature stops working every seventh day, come and tell us that the God of Nature wishes us to do likewise." There is to be remembered that nature does rest for many weeks in the winter time. Is this rest beneficial? or is it useless? A CLERGYMAN'S WIFE.

[It seems to be imagined that my Answers to Correspondents—discontinued for this among other reasons—were addressed to readers generally, and not to special querists. There might be remembered also that animals, men included, sleep at times, and this rest is decidedly beneficial. So with the winter's rest—in our latitudes at least—for there is no such rest in the tropics. *Quorsum hæc tam putida tendunt?* I believe even, as society has come to be constituted, that the seventh-day rest is good for our working classes, or, at least, it might be, if they were not so cruelly robbed of its benefits. One of the best and purest teachers the world has known, perhaps the very best, taught that this seventh-day's rest was devised for the benefit of man—which is true, whatever theory of the origin of the observance is accepted. But it is used as if it had been made for man's punishment and to benefit only a certain small class of persons.]

## FOSSIL GUM.

[718]—Referring to Mr. Clark's inquiry about fossil gum, I think it may possibly interest some of your readers to know that it is dug up in tracts of country (in the northern island of New Zealand) where large forests of Kauri are supposed to have existed ages ago. The gum is exported largely to England for reshipment to America, for the purpose of making varnish. Good quality realises as much as £20 per ton.

Some beautifully clear specimens of this gum are used for ornamental purposes. I possess a piece in the rough which, in colour and transparency, resembles very clear barley-sugar. There are three kinds of Kauri—the white, the red, and the mottled. The latter is comparatively scarce. It is a conifer, I believe. The Kauri tree (white) grows to a great height (the stem attaining to 90 ft. before throwing out a branch). It has been known to grow to 200 ft. from the ground to the head, the stem having a diameter of 12 ft. This wood is very tough, and takes a good polish; consequently it is very useful for building purposes, both for houses as well as for ships. It is, I think, the only wood that shrinks endways. M. A. C. R.

## A PUZZLE.

[719]—"A squirrel is sitting upon a post and a man is standing facing the squirrel, the squirrel presently turns round and the man moves round with it, always keeping face to face. When the man has been round the post has he been round the squirrel?"

BUBBENHALL.

## LETTERS RECEIVED.—CONTENTS NOTED.

R. H.—R. R.—C. C. R.—Senex—Language—H. A. A.—F. W Cleworth—C. J. Brown—J. M. Hunt—H. S. S.—G. E. Clarke—W. H. S. M.—Jocelyn—T. R. Street—T. K. D.—Inquirer—Luke—G. T. Shan—T. Quilliam—G. Sidus—W. Waterhouse—More Light—C. Craven—G. I. I.—Constant Reader—Israelite—C. Eyre—J. Venn—J. G.—G. Alston—G. S. M.—G. M. G.—F. H. M.—J. Graham—M. B. A.—J. Esham—T. B.—L. Thomson—Pleiades—J. B.—R. G.—C. H. Johns—M. Ridley—F. R. G. S.—A Clergyman's Wife—Upsala—E. C. S.—W. Grandy—C. Carus Wilson—Z.—F. C. Rearden—E. Keelan—J. H. W.—W. G.—F. J. C. Trenton—R. R. C.—J. Watson—S. M. B.—W. J. W. Rees—Fide tutus aclatus—E. T. C. W.—T. S. Bayley—Faciebat—Julie Magny—H. A. Kay—W. J. O.—R. J. Whitley—E. C. R.—R. R. Baldrey—R. R.—T. V. R.—A Country Clergyman—T. Claydon—T. Common—P. J. T.—H. J. M.—Tycho.—Rev. E. L.—W. More.—W. Clift—Familiar Experience—M. E. Hoskiss—Rev. P. T. L.—C. Murray, sen.—L. L. K.—Doctor of Divinity—Evolution—K. Kuster—R. M. Rollins—K. Saptander—Cornish Miner—A Pleased Subscriber—Dr. D. V. M.—&c.

# Our Paradox Corner.

## THE SOLAR SYSTEM ALL EQUALLY ILLUMINATED BY THE SUN.

[The *Oxford Chronicle and Berks and Bucks Gazette* has discovered that we are possessed by a very angry feeling towards Mr. Collyns Simon, the discoverer of the theory indicated by the above title. This is manifest to our clear-sighted contemporary, and must have been observed by our readers; for in December, 1881, not more than fourteen months ago, we animadverted in terms of bitterest animosity upon the theory—even going so far in our malignity as to express the opinion that it is "quite untenable." This was in answer to a letter which came from the neighbourhood for which our contemporary provides instruction; and though the writer in the *Oxford Chronicle* expresses his belief that we wrote that letter ourselves to ourselves, we believe he has reason to know considerably better. To show further our intense anxiety to demolish Mr. Simon's theory, we have even gone to the terrible length—receiving, as it chanced, no more questions about it—of saying nothing more on the subject for fourteen months! But the *Oxford Chronicle and Berks and Bucks Gazette* has had our evil courses in view, and has only been waiting till time was ripe to crush us utterly. We are "full of astronomical paradoxes," we treat everything as a paradox which is contrary to our own notions, and worst of all, we have "attacked, in turn, every scientific man in the land." Now, since Messrs. Herbert Spencer, Tyndall, Huxley, Darwin, Huggins, Owen, and a host of others of like or scarce inferior eminence have never been attacked here, this last can only mean that there are no scientific men in the land but Hampden, Parallax, Newton Crosland, and Collyns Simon. For though we have shown reasons for dissenting from views held by Dr. Siemens (on a subject outside his own field), by Sir W. Thomson (on a purely speculative subject), by Prof. Tait, and our friend, Mr. W. M. Williams, these belong to the same class as Messrs. Huggins, Huxley, and the rest, and cannot, therefore, be included among scientific men by the *Oxford Chronicle and Berks and Bucks Gazette*.—The Editor.]

"When we drew attention to this new and remarkable fact in our issue for Nov. 12, 1881, we were able to say that no scientific writer nor (*sic*) journal had attempted to dispute its truth. But this is now no longer the case. We cannot say this now. One writer has presented himself, endeavouring to make this great fact appear improbable; and we now again revert to the subject in order to show how this writer, instead of throwing any doubt on the fact, as he, with a good deal of *animus*, labours to do, helps very considerably, but most unconsciously, to make it clear to unscientific people, as it has long been to the scientific, that there is no room whatever for doubt respecting it.

"The discovery in question is that, outside the atmosphere of the planets, the sun's light falls equally upon each point of space exposed to it, and that consequently it falls with equal intensity upon the atmosphere of each planet. We now repeat here the two very obvious principles, as stated in our former notice, which render this proposition easily intelligible:—

"1. Outside the atmospheres of the planets the sun's light passes through no medium which could diminish this light to any perceptible extent whatever. Upon this point all writers have been long agreed.

"2. The medium thus existing outside the atmosphere of the planets being *nil* in its effects, each point of space, remote as well as near, which is exposed to the disc of the sun receives upon it a line of light (of luminous waves, if that expression is preferred) from each point of the disc; whereby a cone of light is formed, with its base upon the disc and its apex upon the illuminated point. Thus the highest degree of light which the source naturally gives is concentrated upon each of the points exposed to the source, just as if there were but that one point exposed to it in the whole universe, and this cone is formed at every distance from the source, and in all directions. The converging lines which constitute it are not rendered fewer upon any point by the mere circumstance of there being two or more points instead of one, nor are these lines of light fewer upon the more distant point than upon the point that is nearer to the source.

"These are the two simple principles from which the fact results but simple and obvious as these principles are, they have found an energetic opponent in a writer who seems to think that it is the apparent expanse not the real expanse of the disc that gives out the light, and that therefore, the greater the apparent diminution is, the less light is there to give out.

"Mr. Richard A. Proctor, lecturer and journalist, a writer full of astronomical paradoxes himself, but regarding everything as a paradox which is contrary to his own notions, and who has, in his journal called Knowledge, attacked in turn every scientific man in the land, falls foul, in the number for Dec. 16, 1881, page 144, of the great fact that the whole system is equally illuminated by the sun—mainly, it would appear, because this great fact was not discovered by himself—the questioner there and the answerer being evidently the same person.

"After seeking to throw a little confusion over the whole subject by affecting to think that the degrees of light seen on the disc itself—seen, moreover, through our dense medium—is the degree of it here spoken of as surrounding the atmospheres of the planets after seeking to make this confession (*sic*), he proceeds to argue that when the source is apparently diminished—when, without being really diminished it is made to appear so to the eye (as, for instance, by perspective)—then the real and undiminished source of light itself really gives out, in all probability, less light to those spots of space than it does to others where this apparent diminution does not present itself; that, in short, an unreal (merely apparent) difference in the size of the source most probably makes a real difference in the light it gives. Upon what grounds he advances this strange probability he declines to tell us, beyond saying that it is in every case the diminished disc, and not the original undiminished disc, which must be regarded as emitting the light that falls upon the atmosphere of each planet, the feebler light proceeding in each case from the smaller disc, and that for this reason the sun's light outside Neptune's atmosphere is truly said to be 900 times a feebler light than ours. 'If we receded from the sun,' says Mr. Proctor, 'till our distance were twice as great as it is, his disc would look only one-fourth as large as it does. The correct inference is that we should get but one-fourth of the light we actually receive. But, somehow, Mr. Simon makes out that we should get quite as much as we do at present.'

"The fallacy of this reasoning (which is fully discussed in Dr. Collyns Simon's work upon the subject) will become quite clear, even to Mr. Proctor, if he will only look at the sun with his telescope reversed. He will find the disc can be diminished *ad infinitum* to the eye without its making the least difference in the degree of light around us. He will find that, notwithstanding all apparent variations in the size of the sun, there is no real variation whatever in the light he gives, and that even when the perspective disc is as small as when seen from Neptune, there will, nevertheless, proceed light from each point of the original unperspective disc to each point of interplanetary space exposed to it, precisely as if there were no perspective disc, and precisely as if there were but that single point to be lighted in the Universe.

"Now the proposition in question is (we repeat), that when there is no medium to obstruct the sun's light it all goes from every part of the original disc to each spot of space exposed to it independently of our eyes and of all laws of perspective; and when a writer can find no other argument against this fact than the bald assertion that perhaps it is not so, and that perhaps the original and real disc gives less and less light to the solar system in proportion as it can be made to appear diminished by perspective or otherwise, it is evident that such a writer must be hard set to find any argument whatever for his purpose; and this is the first inference we draw from Mr. Proctor's remarks. The rottenness of the argument he brings forward shows how utterly he is without any solid objection to the discovery.

"But again, when a fact, acknowledged to be of great importance, has had public discussion (a prize of fifty guineas having been offered for the detection of any error connected with it), and has been, moreover, laid before all the leading scientific men of Europe for three or four years, if, in such a case, no one comes forward with a dissentient voice but Mr. Proctor, this circumstance also will be apt to strike most people as very strong evidence that Mr. Proctor's argument is not a solid one, even before they become acquainted with what this strange argument is, in which he confuses in so grotesque a manner the physical fact with the physiological; a blunder, however, quite in keeping with his assertion on the following page of his journal (query 96) that the pressure of bodies on each other is something different from the attraction of the earth!—and this is the second inference which we draw from Mr. Richard A. Proctor's attack upon this great discovery. His being the only opponent of it is, even for those unacquainted with the subject, pretty clear proof that the discovery is established beyond all dispute."

[And *what* a discovery it is! A globe 1,000 miles in diameter, can entirely hide from any point on the sun a globe 10,000 miles in diameter, ten times as far away—receiving on its surface all the light which otherwise would have fallen on a surface 100 times as large. Yet the same amount of light will illuminate the larger surface as brightly as the smaller! Then, again, how foolish people are to draw near a light when they want to see better. It gives quite as much light farther off!—R. A. P.]

# Our Mathematical Column.

## DOUBLE RULE OF THREE, OR COMPOUND PROPORTION.

By Richard A. Procter.

THE rules commonly given in our books of arithmetic for Double Rule of Three are not so clear that the student applies them readily and understandingly. I have found in practice—as, for instance, in explaining Compound Proportion to my children—the following reasoning effective :—

In every case of simple proportion, we have to determine what a certain quantity becomes when increased or diminished in a certain degree or ratio represented by two other numbers. Even when composite concrete quantities are given, we can always represent the ratio of these quantities by numbers, when we have reduced them to the same denomination. (In the very nature of the case they are of the same *kind*.)

For instance, suppose we have such a question as this,—

*If* 7 *cwt.* 2 *qrs.* 3 *lb. of something or other cost* £2. 10*s.*, *how much will* 5 *cwt.* 1 *qr.* 5 *lb. cost?*

We see at once that the *diminution* of the quantity will *diminish* the cost *in the same ratio or degree*; so that our answer is

$$£2.\ 10s. \times \frac{\text{as many lb. as there are in 5 cwt. 1 qr. 5 lb.}}{\text{as many lb. as there are in 7 cwt. 2 qrs. 3 lb.}}$$

Again, suppose we have such a question as this,—

*If a company of men working* 6 *h.* 15 *m. a day do a certain piece of work in* $3\frac{3}{4}$ *days, in what time will the same company, working* 7 *h.* 17 *m. a day, do the job?*

Here we see, as readily, that the *increase* in the time of working per day will *diminish* the duration of the job *in the same ratio or degree*; so that our answer is

$$3\tfrac{3}{4} \text{ days} \times \frac{\text{as many min. as there are in 6 h. 15 m.}}{\text{as many min. as there are in 7 h. 17 m.}}$$

In one case decrease brings proportionate decrease, and increase brings proportionate increase; in the other, increase brings proportionate decrease, and decrease brings proportionate increase. One is a case of direct proportion, the other a case of inverse proportion. But the use of these terms does not make the reasoning simpler or more obvious; while applying technically-expressed rules is likely to make the student go wrong where, if he were left to his own reasoning, he hardly *could* do so.

The case is similar with Double Rule of Three, and with Compound Proportion generally; only we get more than one multiplier like the multiplier in each of the above examples.

Thus, suppose the question asked,—

*If* 10 *men working* 6 *hrs. build* 17 *ft. of a wall, how much of the same kind of wall will* 17 *men build, working* 5 *hrs?*

Here it is obvious that the *increase* in the number of men will tend to *increase* the length of wall *in the same degree*; while the *diminution* in the hours of working will tend to *diminish* the length of wall in the same degree; so that our answer is

$$17 \text{ feet} \times \frac{17}{10} \times \frac{5}{6};$$

all we have to do is to see that these multipliers are *increasing* ones or *diminishing* ones, according to the obvious effect of the change of which the question tells us.

Suppose, instead, the question,—

*If* 10 *men working* 6 *hrs. a day build a certain wall in* 17 *days, in what time will* 17 *men working* 5 *hrs. a day build the wall?*

Here it is obvious that the *increase* in the number of men tends to *decrease* the time *in the same degree*, and that the *decrease* in the hours of working tends to *increase* the time *in the same degree*, so that our answer is $17 \text{ days} \times \frac{10}{17} \times \frac{6}{5}$.

Again, take this question,—

*If a wall* 17 *ft. long is built by* 10 *men in* 6 *hrs., in what time will a wall* 23 *ft. long be built by* 13 *men?*

Here it is obvious that the *increase* in the length of the wall must tend to *increase* the time in the same ratio, while the *increase* in the number of men must tend to *decrease* the time in the same ratio. Thus the answer is

$$6 \text{ hrs} \times \frac{23}{17} \times \frac{10}{13}$$

In the first of these three cases both ratios are *direct*; in the second both are *inverse*; in the third one is *direct* and the other *inverse*. But in none of the three can any doubt or difficulty arise.

(*To be continued.*)

---

To see the absurdities of the prejudices against it, we need only remark that science is simply a higher development of common knowledge; and that if science is repudiated, all knowledge must be repudiated along with it.—Herbert Spencer.

# Our Whist Column.

## By "Five of Clubs."

Proper Lead.—Having no trumps, should the rule of leading Ace hold in a very long suit?

Hand. A home game, played for love. My partner dealt. Trump H. 5. Score.—Three all.

My hand was:—Hearts (trumps)—none; two Spades—Ace, Queen; seven Clubs—Ace, Nine, and small ones; four Diamonds—Queen, Knave, Nine, Seven.

Trick 1.—Spades led; I took with Queen.

Trick 2.—I led Ace of Clubs; partner played King; adversaries, small cards.

Trick 3.—I led a small Club; partner trumped, and was over-trumped.

Trick 4.—Spades led again; my Ace was trumped, and we lost by two tricks.

We then re-played the hand carefully, leading a small Club at Trick 2, and won by two tricks. My partner held six trumps, headed by King and Queen. Ace was with leader.

Should I, having no trumps, have led the Club Ace, or given partner the chance of taking trick and then leading trumps if he could?

P.S.—Not playing by rule had just before led to disaster, thus:—We were (my son and myself) a treble and four on against a single. My partner led a small Diamond. I had Ace, King, and Three. I took with the King, and rashly returned him Ace before leading from six trumps. My Ace was trumped, and we lost the odd trick, and next hand lost the game and rubber. Q. T. V.

[I can see no reason for departing from rule when you led first. There were two chances to one against your partner holding the King. It was unfortunate, of course, that he held the King unguarded, but that is all that can be said. You could not *know* that a small Club would turn out well; it might have turned out very badly. Why, however, did you go on with Clubs? You were not only forcing your partner, who alone could have any trump strength to save your game, but forcing him under unfavourable conditions. You should have led a small Diamond. Your game was lost unless your partner had great strength in trumps and good strength in Diamonds. Your right-hand opponent had indicated length in Spades—probably great length, the cards being unevenly divided. The winning Clubs were with the enemy. Your best chance, *after the second trick*, was to lead a Diamond.—Five of Clubs.]

---

Learning Whist.—Is it, in your opinion, possible for four unfortunate beings, whose whist education has been neglected, by playing together, to learn the scientific game, referring occasionally to Cavendish as to the play? The process of learning by playing with experienced "whistists" is rather too painful to all concerned to recommend itself, save as a last resource. Please give us the benefit of your advice in this matter. Four of Hearts.

[Nothing easier. Let the learners agree to study the simple rules of play, and call each other's attention to mistakes as noticed. The art of *conducting* a game well comes later. Cavendish, however, is rather too technical for beginners.—Five of Clubs.]

---

Exposed Card.—A player having an exposed card, not being able to follow suit, contends he has a right to play any card which may best suit his purpose in lieu of the exposed one, unless the exposed card is within reasonable time called by his adversaries; is this so or not? If so, it then follows the offending player may take advantage, and can dispute what is "reasonable time." Querist.

[In practice no difficulty need occur. If the exposed card is not at once called when it is the owner's turn to play, he should wait to ascertain whether the opponents wish to call it. But he has no more right to hurry their decision than a player has to hurry any one in playing to a trick. There is no law forbidding anyone to wait an unreasonable time before playing. Neither is there any law forbidding players to wait an unreasonable time before deciding whether to call or not. In practice, no such law is necessary. But the player who, having an exposed card, plays without waiting to know whether it is called, is no more "in his right" than one who, getting impatient, plays out of turn.—Five of Clubs.]

---

M. G. B.—Your opponents, who, when the score was two all and you made two by tricks and two by honours, denied you the game on the plea that tricks count before honours, so that your score was made four by your two tricks, and you could not count honours, know—let us hope—very little of the game. If they do know the game, and were not joking, my advice to you is not to play with them any more.—Five of Clubs.

XUM

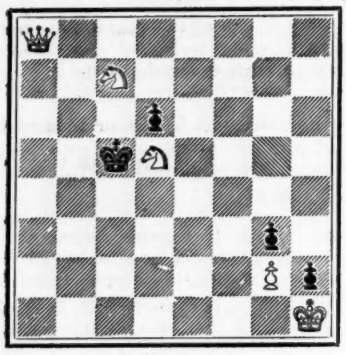
# Our Chess Column.

By Mephisto.

## PROBLEM No. 74.

By C. Planck.

Black.



White.

White to play and mate in three moves.

## GAME PLAYED IN THE SUSSEX CHAMPIONSHIP TOURNAMENT, JANUARY, 1883.

ENGLISH GAME.

| White. W. Mead. | Black. F. Marquardt. | White. W. Mead. | Black. F. Marquardt. |
|---|---|---|---|
| 1. P to QB4 | P to K3 | 18. Kt takes Kt | Q takes Kt |
| 2. P to K3 | P to Q4 | 19. P takes P | QR to B sq |
| 3. P to Q4 | Kt to KB3 | 20. B to Q2 (*g*) | B takes P (*h*) |
| 4. P to QR3 | B to K2 | 21. R to Kt sq | B takes P |
| 5. Kt to QB3 | Castles | 22. B to B3 | B takes P |
| 6. Kt to B3 | P to QB4 (*a*) | 23. R takes P | R to KB2 (*i*) |
| 7. BP takes P | KP tks P (*b*) | 24. Q to R sq | P to B5 |
| 8. P to KR3 (*c*) | Kt to K5 (*d*) | 25. Kt to B sq | Q to R5 |
| 9. B to Q3 | P to KB4 | 26. Q takes RP | P takes P (*j*) |
| 10. Q to K2 (*e*) | B to K3 | 27. Q takes B | Q to B7(ch) (*k*) |
| 11. Castles | QKt to B3 | 28. K to R sq | Q takes B |
| 12. R to K sq | P to QR3 | 29. R takes Kt | B takes R |
| 13. Q to Q sq | B to B3 (*f*) | 30. Q takes R (ch) | B to B sq |
| 14. Kt to K2 | P to KKt4 | 31. Kt takes P | Q to Q6 |
| 15. B to B2 | Kt to K2 | 32. Kt to Kt4 | P to Q5 |
| 16. Kt to R2 | Q to B2 | 33. Kt to R6 (ch) | Resigns |
| 17. P to B3 | Kt to Kt6 | | |

### NOTES.

(*a*) Later on this move enables White to isolate Black's Queen's Pawn. We think P to QKt3 better on account of the support it gives to P to B4, and also providing a convenient square on Kt2 for the Queen's Pishop, at present shut in.

(*b*) Kt takes P deserves a slight preference.

(*c*) White is losing time; he ought to play 8. P takes P, B takes P. 9. B to Q3, or 9. P to QKt4, followed by B to Kt2.

(*d*) This move weakens the defence if played at an early stage of a game, before the forces have been fully developed, as it forms a convenient object of attack.

(*e*) Q to B2 was better play, preceded by P takes P.

(*f*) Black might have taken advantage of White's indifference. He would have obtained a strong position by playing Kt takes Kt. 14. P takes Kt, P to QB5, followed by 15. P to QKt4.

(*g*) White having missed the opportunity of bringing this Bishop into play on his ninth move, now attempts to do so at great disadvantage to himself. He ought to have played R to Kt sq first.

(*h*) Before doing this, Black might have ventured on P to Kt5.

(*i*) Unnecessary precaution, and weakens his position very much.

(*j*) Had Black not played R to B2, to which move the loss of his game is to be attributed, he might have played R to QB3 with advantage. Nevertheless, Black might have done better by postponing P takes P and playing B takes RP instead, if then 27. P takes B, P takes P. 28. R to K2, Q takes P with a strong attack.

(*k*) He ought to have submitted to the loss of the piece and played QR to B sq.

### Solution of Prize Problem, by Pearson (page 62).

1. QKt to Kt5 (threatening mate by P to Q4)
2. Kt to Q6
3. R to B5 (ch)
4. Kt to B7 (mate)

| (*a*) | | (*b*) | |
|---|---|---|---|
| | P takes Kt | | |
| 2. B to B4 | P tks B, or (*b*) | | R takes B |
| 3. P to Q4 (ch) | P tks P en pas. | 3. R takes P (ch) | |
| 4. R to B5 (ch) | | and mates | |
| mate | | next move | |

1. Q to Q6, or (*a*)
2. Q to Kt3
3. Q takes R

## ANSWERS TO CORRESPONDENTS.

*** *Please address Chess Editor.*

R. Pilkington.—Your opponent certainly had no right to object to your move because he considered it a bad one. He must abide by 5. Kt takes KP, but having avowedly made his sixth move under a misapprehension, you might allow him to re-consider it.

A Learner.—Problem No. 70. If 1. B takes P, P to Kt6, and there is no mate.

J. Simmonds.—Received with thanks.

John Lonsdale, Alex. S. Orr.—If 1. Kt takes Q, R takes P, and there is no mate.

W. Collins.—In game, p. 61, on move 16, if Black plays Q to K4, then White would maintain his advantage by 17. R to B5.

J. Hughes.—Problem 71. If 1. Q to K3, B to Q6, and there is no mate.

Correct solutions received.—Problem No. 71, J. A. Miles. Prize Problem, Clarence. No. 72, double solution received only from W.; first solution, Clarence, John, Berrow. No. 73, W., Berrow, J. Adamson, R. J. P., Clarence, A. K. McAdam.

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